WILK-145 (951*196)

EXERCISE GARMENT

Cross Reference to Related Application

This application is based on provisional application Serial No. 60/416,014, filed October 3, 2002.

Background of the Invention

Various patents describe different forms of exercise garments. One approach taken is to provide a garment which includes elastic bands requiring a greater force to stretch the bands and permit the bands to return toward their original position than is required for the base fabric used in the remaining portion of the garment. Where the garment is a suit having a shirt portion and a pants portion such bands are provided on the arms and legs portions of the suit as well as on the body portion. The ends of the bands may be anchored such as to the hands or feet sections of the shirt and pants. Different forms of anchoring have included gloves or wristbands on the hands and ankle bands and stirrups on the feet. The pants portion may be full length pants or short pants. Where the pants portion is not integral with the shirt portion the pants portion might be worn separately by having suspenders secured to the upper area of the pants portion

with the suspenders then extending over the user's shoulders.

The benefits of such exercise garments are achieved when the user participates, for example, in an exercise program which would involve extending the user's arms or legs. Benefits could also be achieved during normal activities of the users which would also involve movement or extension of the arms and legs or bending of the body. While performing these activities the resistance bands would require the user to expend additional energy in the stretching or extending of the arms, legs and/or bending of the body in order to overcome the resistance of the elastic bands and to resist or control the bands returning to their original condition.

There is also an awareness of the need and desirability for various types of exercise devices which are specifically directed toward the abdominal area and low back muscles. Such devices have taken the form of exercise equipment which would result in exercise of the muscles in the abdominal region. In addition to separate equipment attempts have also been made to provide different forms of abdominal bands to strengthen the abdominal muscles.

Summary of the Invention

An object of this invention is to provide an exercise garment in the form of a pair of pants worn separately without the need for suspenders.

A further object of this invention is to provide an exercise garment which is intended to specifically address exercise of the muscles in the abdominal region and low back muscles.

In accordance with this invention an exercise garment is provided in the form of a pair of pants which includes resistance bands but wherein the use of suspenders is optional rather than a requirement.

In accordance with a further embodiment of this invention an exercise garment is provided with structure for specifically addressing the muscles in the abdominal region.

The invention is also concerned with setting forth guidelines and a method for controlling the performance of an exercise garment in general by proper selection of different factors which affect the performance.

The Drawings:

Figure 1 is a rear elevational view of an exercise garment in accordance with one embodiment of this invention;

Figure 2 is a front elevational view of the garment shown in Figure 1;

Figures 3-4 are rear and front elevational views of yet another garment in accordance with this invention;

Figures 5-12 are rear and front elevational views of further forms of exercise garments in accordance with this invention;

Figure 13 is a front elevational view of yet another garment in accordance with this invention;

Figures 14-15 are rear and front elevational views of the type of garment shown in Figure 13;

Figures 16-19 are elevational views showing use of the garment of Figures 13-15;

Figures 20 and 21 are rear and front elevational views of yet another form of exercise device in accordance with this invention; and

Figures 22-24 are bar graphs showing results in use of the types of garments in accordance with this invention.

Detailed Description

Figures 1-2 show a resistance garment 10 in accordance with one embodiment of this invention. Garment 10 is in the form of a pair of pants wherein the use of suspenders is optional. As shown therein garment 10 includes a body portion 12 and a pair of leg portions 14,14. The top 16 of body 12 would be located at or slightly above the waist of the user and would include structure for maintaining the garment 10 on the user without the need for suspenders. Thus, as illustrated, the top of the pants converges inwardly and then outwardly. If desired any suitable connectors 18 may be provided at the top portion 16 of garment 10 so that suspenders may be optionally attached to the garment and used in a conventional manner. In that regard, loops, holes, buttons, clips, etc. may form the attachments 18 for the suspenders.

The top portion 16 could include an internal drawstring or an elastic high waist area to hold the garment in place without the use of suspenders.

As best shown in Figure 2 an adjustable triangularly shaped abdominal panel 20 attached to base fabric 22 is sewn at the midline or otherwise attached at the waist. This panel 20 is a lateral resistance band of any suitable material such as high density lycra. Each

leg has a band 24 attached to the base fabric 22 and attached at the front to panel 20. The band 24 is preferably of one piece construction wrapping around the leg both from front to back. This arrangement will stress load the fast burning high fatigue surface muscles, tensor fasciae latae, sartorius, gluteus minimus and medius. The long haul load will be to the vastus intermedius, lateralis, rectus, femoris and the weaker hamstring group. The base fabric 22 is preferably a light density of lycra of 3%. Also, thermal properties fabric could be used to help in thermal and moisture control. The band 24 which extends down the body and legs is made of high density compliant fabric which preferably is stretchable in a north/south pull direction. The lateral placed band resists weaker muscle groups.

Preferably, the elastic band 24 is anchored in the foot area by any suitable anchoring structure. In the illustrated embodiment the garment 10 ends in a half stocking 26 foot attachment as the anchoring structure.

If suspenders are used the attachment points 18 are in the waistline in direct contact with the high density bands 24 that have a north to south pull. An EMG study of the garment 10 showed a 28.3% in electrical activity as compared to regular athletic wear.

The garment 10 illustrated in Figs. 1-2, is capable of being worn without suspenders. This would make the garment easier to put on and take off and be more comfortable. Preferably, the garment is a high-waist garment which would have its own securing structure, such as a drawstring, a belt, an elastic band, buckles or velcro fasteners. Where suspenders are preferred the garment includes detachable fastening structure to accommodate the suspenders. Such structure could be of any suitable form such as loops, snaps, buttons, velcro or hooks. The inclusion of the suspenders would give additional tension to enhance performance.

Figures 3-4 show a further practice of this invention utilizing an abdominal/oblique resistance garment 30. As shown therein, garment 30 has its shirt and pants as a one-piece suit which incorporates high density compliant fabric 32 made of one long piece that begins over the oblique muscles, runs up the chest and over the shoulders and then down the back/spine and over the buttock and begins to turn around the leg and anchors in the remedial part of the leg. As the band 32 wraps around the leg it is joined at its beginning point. If desired, pockets may be included in the thigh area.

As best shown in Figure 4 an active X banding system 34 is located over the abdomen making garment 30 a

caloric burner. As the user walks the stride leg goes forward pulling the X 34 forward and the rest of the upper bands, as the other leg goes backward, also pulls in the opposite direction taking the other half of the X 34 and the upper bands with it, inducing resistance. Base fabric 36 could be of any suitable material such as 85% supplex and 15% lycra, although other fabrics can be used. In use, the oblique muscle groups are exercised by bringing the banding system 34 up and over the high hip/abdomen with the abd muscles themselves. Pockets 39 are located in the low position of the legs on either the inside and/or outside of the garment. Garment 30 could also include specific crouch fabric 38 to maximize comfort. Although garment 30 is shown as terminating in the upper leg area the leg portions could extend downwardly to be in the form of shorts that terminate slightly above or below the knees or long pants extending to the ankles.

Figures 5-6 show a further garment 40 in accordance with this invention. As shown therein garment 40 would include any suitable base fabric 42 such as 3% lycra having 4-way stretch. Resistance bands 44 could be made of high resistance elastic material, such as high density 32%, lycra type fabric. The resistance band or material 44 starts at location or border 64 with material 50 and moves up over the shoulder and down the back to the front

at border 46 to form the abdominal V-panel 48. The material 50 which could be made of high density 32% lycra acts to pull down and lock the garment 40. The leg portion of the material 50 is tapered and originates from the back along the sewn edge 64 of the band 44 that is coming around, forming the abdominal panel.

The V-panel 48 includes a graduated blocked series of mirror image blocks of variable density and fabric orientation. Upper blocks 52 are preferably made of 32% lycra having north/south pull. Block 54 could be made of 28% lycra having a direction of pull in the 11-5 o'clock position. Block 56 opposite block 54 could be made from resistance material have 10% lycra with the direction of pull also in the 11/5 o'clock direction. Block 58 could be made from resistance material having 10% lycra with the direction of pull in the 10/4 o'clock direction. Opposite block 60 could be made from a resistance material having 28% lycra with the direction of pull in the 10/4 o'clock direction. Lowest blocks 62,62 could be made from a material having 32% lycra with the direction of pull being transverse in the 9/5 o'clock direction. These series of blocks will produce a push/pull effect between the inner muscle groups.

As shown in Figure 5 the garment 40 includes the panels 44 made of resistance material such as 32% lycra

type fabric with the panel 44 returning to the front forming the V abdominal panel 48 and its series of blocks having variable densities and directions. The base fabric 42 is made of any suitable material such as 3% lycra-type fabric having four-way stretch. Figure 5 illustrates the sewn edge 64 which is the beginning point for the resistance band 44 forming the tapered pants having north to south orientation.

Figures 7-8 show a resistance garment 40A which is a variation of the garment 40 shown in Figures 5-6. As shown therein the V panel 48A has less blocks than panel 48. Panel 48A has, for example, blocks 52A and 62A which may be similar to blocks 52 and 62 or to blocks 54, 56, 68 and 60. Similarly, the set of blocks in V panel 48A may include a total of six blocks rather than the eight shown in Figure 6 or may include more than eight blocks. Figure 7 shows the resistance bands 44A on the rear of garment 40A to extend in abutment with each other and be sewn together along a longitudinal line 65.

Figures 9-10 show yet another resistance garment 40B which is a variation of the garment 40A. As shown therein the V panel 48B includes larger blocks 52B and 62B. In addition, the upper section above blocks 52B,52B is divided into a pair of connecting sections 66 made of elastic resistance band material.

Although Figures 6, 8 and 10 show the blocks to be of the same size and shape, the abdominal panel could include various blocks of different size and/or shape of other blocks.

Figures 11-12 show yet another resistance garment 70. As shown therein, garment 70 is an abdominal resistance one-piece suit. The garment 70 has the features of high density banding 72 as a one-piece fabric that begins under the arm, comes up over the chest and over the shoulders and tracks along the spine and then widens over the buttocks and wraps around the leg where it is anchored. Any suitable base fabric 74 may be included in garment 70 such as a base fabric made from 85% supplex and 15% lycra. Figure 12 shows pockets 76 located in the front lower legs either on the inside and/or outside of the garment. The resistance banding 72 is preferably a material made of high density lycra with north to south pull. The base fabric could include a crotch area 78 which incorporates wick-away fabric. Garment 70 applies resistance to forced trunk flexion which is the main action of the abdominal muscle group. This is further enhanced by the user doing the crunches in a supine position adding more stability and anchoring by laying directly on the banding system 72 and having to pull against it.

The suit 70 could include a separate crotch fabric. In addition, instead of having a separate base fabric 80 along the side, that portion of the suit could be part of the band materials 82. Instead of both portions 80 and 82 being separate fabrics as shown in Figure 11 a further modification could be to extend the band material 72 on each side of the suit as shown in the front view of Figure 12 closer together so that only a narrower stretchable portion 74 is located in the center of the front of the suit. These changes would result in a suit which is more of an abdominal oblique type.

Although the various abdominal exercise garments are illustrated as having short leg sections which is a preferred practice of the invention it is to be understood that such garments may include longer sections including short pants versions which would extend to the general area of the knee including either slightly above or below the knee, as well as long pants versions extending to the ankles.

The various abdominal exercise garments function to flatten or shape the mid-section of the user. Most of the garments are characterized by the inclusion of a panel in the abdominal area which is woven into the garment. The panel is made of resistance band material which works the obliques on the side and the back muscles. The panel, such as panel 34, or panel 48 could be located at any suitable portion of the mid-section, such as the back,

front or side. The panels are preferably made of elastic resistance material. Alternatively, the panels could be made of relatively non-elastic material with the base fabric being elastic so as to cause a pull in the abdominal region against elastic material. The panels give support to the mid-section in a general girdle effect. This works the mid-section, flattens and shapes the mid-section and supports the mid-section. If desired, the panel could be made of a contrasting readily visible color so as to be readily identifiable for market recognition purposes. Figures 6, 8 and 10 illustrate the panel to be formed from a series of inclined blocks of parallelogram shape. These blocks could have any geometric shape such as a square, rectangle, triangle, diamond or any other polygon.

Figures 20-21 show yet another resistance garment 120 which takes into account that designing a garment without suspenders has some difficulty. In the garment 120 the knee design functions as the suspender having a closed loop resistance mechanism. The panel from the calf being of one piece comes up over the lateral surface and crosses on top of the oblique thigh/glut panel. This closes the loop and provides resistance in both the forward and backwards leg position seen in walking. The warp direction is north to south and when the calf panel crosses over the knee it has a twist to its warp direction, adding more resistance.

As shown in Figure 21 an abdominal panel 122 is secured to the base fabric 124 and is also secured on its lower edge to a waist panel 126 which also offers resistance as compared to the base fabric 124. Abdominal panel 122 and/or waist panel 126 may be located at only the front of the garment extending from one side to the other or may completely encircle the garment.

A key feature of garment 120 is that a resistance panel 128 in each leg of the pants section extends from the calf over the knee and crosses on top of the oblique thigh/glut panel as indicated by the reference numeral 128a. The band or panel 128 also crosses over the knee as indicated by the reference numeral 128b. Thus, the band 128 extends from behind and crosses over the front of the knee portion of the pants section leg and then extends to the inner thigh. The two panel portions 128b on each side of the legs meet and form the waist panel 126. Alternatively, the panel 128a could simply be connected to a separate waist panel 126. Figure 20 shows the two panels 128a being joined together at the rear of the garment. The area 130 where the panels meet could be used to form a pocket. Because the panel 128 crosses over and around the knee, the panel locks on the knee during movement such as in walking or running which causes the thigh muscles to work harder during the swinging that occurs in such walking or running movement.

The resistance band 128 thus comes from behind the knee and crosses over the front of the knee and extends to the inner thigh as illustrated in Figure 21. The resistance band 128 thus includes the thigh portions 128a and the knee portions 128b.

If desired, garment 120 may also include an arm resistance band 132 on each arm of the shirt section of the garment. Band 132 on each side provides north/south or vertical resistance. The two resistance bands 132 may extend from below the elbow to beyond the shoulder and be connected to a neck resistance band 134 which provides a resistance block on both the front and back of the garment. Preferably, the resistance band 132 ends about 4 inches from the end 136 of the sleeve. Neck resistance block 134 may be of any suitable dimension such as 5 inches long and 5 inches high.

The resistance bands 128 and 132 as well as the base fabric in the torso of the shirt portion and in the lower leg sections below the knee portions of the garment could have north/south warp direction, while the base fabric 124 in the arms and in the upper leg sections of pants and the abdominal panel 122 and the waist panel 126 as well as the neck resistance block 134 could have east/west warp direction.

The various resistance bands would offer a greater resistance than the base fabric. All of the resistance bands could offer the same resistance force or

could be of differing resistance force. For example, the resistance panels 128 and 122 could offer more resistance than the remaining resistance bands or panels. Abdominal panel 122 could be confined to the front of the garment beginning at one side and ending at the other side without extending around the back or could completely encircle the garment as an endless band.

Resistance bands 128 could be anchored at their lower end to footwear 138 or could wrap around the foot to form the anchor. The upper ends of the resistance band 128 would be anchored at the waist.

Figures 13-19 illustrate variations of a further garment 90. The concepts involved in this type of structure includes the provision of a superior circumference band that runs at an angle to lock in place using the wider points of the lateral triceps muscles. This circumference band is indicated by the reference numeral 92. A vertical band 94 which may also be made of high density lycra having north to south pull crosses over the joint to apply resistance. Front band resistance is limited by elbow extension. The back band resists flexion at the elbow.

The above arrangement can be applied to any joint so that the location would vary as the purpose varies. Figure 13 thus also shows a further resistance arrangement 96 applied to the legs. As shown therein the arrangement 96 includes circumference bands 98,98 and

vertical bands 100. The leg bands 96 operate in the same manner as arm bands 90. The leg bands 96 lock in at the wider points of the thigh made by the quadriceps muscle group and the gastrocnemius muscles. This will apply resistance to knee flexion, as seen in a walk.

As shown in Figures 14-15 each of the arm bands include a pair of vertical bands 94 while the leg bands 96 include only a single vertical band 100 located at the front of each leg. Although the lower leg needs only the band system in the front to work the invention may be practiced with other designs such as including a vertical band at the back of the leg. The band system 90,96 can be applied directly over pants or a shirt or top or can be used with short pants and a sleeveless shirt. As illustrated there is no need for a foot stirrup or a hand anchor.

Figures 16-19 show use of the band systems 90,96 during an exercise. As illustrated in Figs. 16-19 and in Figs. 13-15 the circumference bands in each band system could be parallel to each other or could be mirror images of each other. Thus, for example, Figure 16 shows the angled circumference bands to be mirror images. Figure 17 shows the band system 96 in use where the bands 98,98 are generally parallel to each other. Similarly, Figures 14 and 19 show the bands 98 to be parallel to each other when viewed from the rear.

Figure 16 also shows the circumference bands 92,92 to be mirror images of each other while other figures show those bands to be parallel to each other.

The garment of Figures 13-19 in itself could be used as a full garment. The base fabric could be a cotton 3% lycra blend and the banding/anchors could be 32% lycra. The garment works well because it loads the joints with a short tight resisting band with a higher compliance factor because of its shortness.

The various garments described herein could be used as outer garments or could be worn below other garments such as sweat suits or even normal clothing. Preferably, the exercise garment is an outermost garment. The garments could include fabrics having thermal properties or other properties to cause the user to have increased sweating for additional weight loss. Garments could include the special wickaway crotch sections.

Tests were conducted to determine the performance of the abdominal resistance garments. The test results are shown in Figures 20-22. The tests involved measuring how much electrical current is required by the abdominal muscles to perform a standardized crunch type exercise, with (garment) and without the resistance abdominal garment (baseline).

PROTOCOL:

The area to be tested was cleaned and shaved if called for. The location was one and half inches superior

to the umbilicus and one inch lateral to the midline. A Deluca EEG/EMG electrode was placed at that location of the right rectus abdominis muscle. The subjects were placed supine on a Wynmor abdominal bench in neutral position with knees flexed and feet anchored. The hands crossed high over the chest. An elastic line was drawn across the room so as to have everyone lifting to the same height. They were instructed to perform the crunch by isolating the abdominal muscle and raising to the elastic line. The tests were timed at one minute apiece. Some subjects performed in the garment first and returned to record the baseline. The testing of the baseline and garment were performed on separate days as to eliminate fatigue. A tracing of the electrode on the skin was used to provide exact replacement of the electrode on the next testing phase. The time of day was the same for both tests. The room temperature was held at 74 degrees F.

PROTOTYPE GARMENT INFORMATION:

Two sizes were used in the EMG testing. A ladies large and medium. The platform fabric blend is an eighty size percent supplex with fourteen percent lycra. The system is 28% lycra. The design intent is to provide resistance to trunk flexion but also to provide comfort, ease of application and support. The advantage of this design is that it can be worn as an undergarment or as outerwear. The materials used have thermal properties, which increases the comfort and extends the wearable time.

EQUIPMENT:

Delucia EEG/EMG electrodes, Wynmor bench, Pathways TR-20C EMG, interfaced with Synergy software.

TEST SUBJECTS:

Eleven subjects were tested, three males and eight females. The age range was from 16 years to 56 years with a median age of 41 years. The individual conditions were from extreme physical activities to a cardiac patient with a surgical history. All performed the tests without incident, and expressed a high degree of interest in it.

TEST CONCLUSIONS:

All test subjects recorded an increase in electrical activity with the resistance garment as opposed to street clothing. The highest EMG recording was 85% which was the 16 year old male, and the lowest was 21% which was the extreme conditioned female. The average for the 11 subjects was 38%. Given how the crunches were performed, the subjects lifted about 4 inches off the bench. Which engaged about a 1/3 of the resistance system in the garment. One would have to come to a very positive conclusion on the overall performance utilizing only 1/3 of its potential. If using the old fashion military abdominal exercises, whereby the person has their hands interlocked behind the head and fully raises and touches the elbow to the opposite flexed knee, would fully engage

the suit and the EMG response would most likely be much higher.

A further aspect of this invention is to provide guidelines for manufacturing an exercise garment to achieve optimal performance. Such guidelines could be used in the manufacturing of not only the garments described herein, but also other types of exercise garments employing base fabric and resistance bands of different elastic resistance characteristics. The method of controlling the performance of the garment would include taking into account one or more of the following factors for optimal aerobic and strength performance. These factors are:

1. Length of the resistance band
2. Width of the resistance band
3. Strength of the material used in the band
4. The type of material used
5. The positioning of the resistance material relative to the normal range of motion
6. The degree that the band fabric is stretched before it is sewn into the garment (this is a pre-stretching characteristic performed in manufacturing the garment)
7. The size of the garment which influences the degree of slack.

The use of pre-stretched resistance bands is particularly noteworthy since it influences the limits where the band can be stretched. The performance control factors can include a number of bands used in the garment and the anchoring techniques with regard to where and what type of anchoring structure is provided as well as the adjustability of mechanical factors such as the provision of suspenders including the changing of the positioning and tensioning properties of the suspenders. A garment could be made which includes non-flexible or non-stretchable material as the anchor structure on one or more ends of the resistance bands. A garment could be made entirely of a base fabric. Preferably, buffer material would be located between the resistance bands and the base material or base fabric to reduce movement of the bands.

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